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ABSTRACT

A study was conducted to investigate the probability of transfer from a two-year college to a four-year college for a random sample of 2,500 students who attended a community college within 2 years of high school graduation in 1980. Nationally representative longtitudinal data from the High School and Beyond study established the characteristics of the 1980 high school graduates, and grouped them by their primary activity within 2 years after high school. On background characteristics, high school behaviors, and achievements, community college students fell about midway between those who went to four-year colleges and those who did not go to college at all. The sample of community college students was divided in two groups: those who transferred to a four-year college (24.3%) and those who did not. Causal models were then used to obtain estimates of the effects of family and student background, high school and college behaviors, and outcomes on the probability of transferring to a four-year college. College behaviors (e.g., grade point average, completed courses in mathematics and science, and employment record) were found to have the strongest direct effects, although other factors, including social class, placement in the academic track, application to college while still in high school, and good grades and high standardized scores exerted important indirect effects on transferring. (Fifty-four references are included.) (Author/EJV)

Factors Facilitating Student Transfer From 2-Year to 4-Year Colleges

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Running Head: COMMUNITY COLLEGE TRANSFERS

ABSTRACT

This paper investigates the probability of transfer for a random sample of 2,500 students who attended community college within two years of high school graduation in 1980. Nationally representative longitudinal data from High School and Beyond were used to describe characteristics of 1980 high school graduates, grouped by their primary activity within two years after high school. On background characteristics, high school behaviors and achievements, community college students fell about midway between those who went to 4-year colleges and those who did not go to college at all The sample of community college students was divided in two groups: (a) those who transferred to a 4-year college (24.3%), and (b) those who did not. Causal models, using least squares regression, logistic regression, and LISREL were then used to obtain estimates of the effects of family and student background, high school behaviors and outcomes, and college behaviors on the probability of transferring to a 4-year college. College behaviors were found to have the stongest direct effects, although other factors, including social class, placement in the academic track, applying to college while in high school, and getting good grades and high standardized scores exerted important indirect effects on transferring.

BACKGROUND

Although community colleges currently enroll over one-third of the American students in higher education (National Center for Education Statistics [NCES], 1985), their academic value in higher education is frequently questioned. Specifically, a large body of research documents the socially stratifying effects of enrolling in community college in comparison to 4-year colleges and universities (Bowles & Gintis, 1976; Dougherty, 1987; Karabel, 1972, 1974, 1986; Pincus, 1974; Rosenbaum, 1976; Vaughn, 1980). Not only are community college students socially and academically disadvantaged in comparison to their 4-year college counterparts (Meznek, 1987; NCES, 1984), but their students are likely to attain considerably less education, after these initial disadvantages are taken into account (Alba & Lavin, 1981; Anderson, 1984; Breneman & Nelson, 1981; Dougherty, 1987; Velez, 1985). These studies, some of which use nationally representative samples, have found that the proportion of community college entrants who eventually receive baccalaureate degrees is from 10% to 20% less than comparable students who enter 4-year colleges (summarized in Dougherty, 1987).

Results from those studies which focus on comparisons of educational attainment of students from community and 4-year college are most relevant to the central question of this paper. However, there are some clear differences. While most of such studies conclude that community colleges are academically (and socially) limiting because the eventual number of years of education for their students is less than those of the comparison group <u>in academically oriented college programs</u>, the

studies do not examine community college students as a whole. Moreover, although the causal models for these studies typically include controls for student characteristics (race, SES, educational aspirations, grades, and curricular track), none of the studies include extensive information about students' high school behaviors (e.g. courses, homework) nor high school outcomes (except grades). More importantly, they include very few measures of students' academically related college behaviors, other than work information and college grades. Nowhere in these analyses do we see information about courses taken, or numbers of credits accumulated during a given time span. However, it seems likely that these behaviors are influential in students' motivation, persistence, transfer, and eventual degree status.

Because of the paucity of information on students' in-college academic behaviors, results from such studies lack the ability to explain <u>why</u> students from community colleges evidence lower educational attainment levels. The three studies which included followup information on the class of 1972 from the National Longitudinal study study conclude that the eventual educational attainment of community college students is less, compared to their 4-year college counterparts. Anderson (1984) showed that 13.4% fewer community college students earn a baccaulaureate degree; Breneman and Nelson (1981) found an 11.3% difference; and Velez (1985), who followed the NLS class seven years after high school graduation, found a difference of 18.7%. Alba and Lavin (1981), whose sample included 2- and 4-year college students in the New York City colleges from 1970 to 1975, found an educational attainment difference of 11.2%. Dougherty (1987), in a review of several

studies examining the comparative attainment for 2- and 4-year college students, speculates that the probable reason why community college students show lower levels of eventual educational attainment relates to the vocational thrust of these schools. However, neither he nor other researchers present empirical evidence about the actual coursetaking behaviors of community college students which would substantiate these claims. In a study which investigated attrition from community colleges attended by NLS-72 students, Mexnek (1987) found that academic factors such as aspirations, academic integration, and institutional commitment were far more important than psychological social factors.

The body of research on community colleges has several inherent weakenesses. First, much of it is not conducted on nationally representative samples. A large proportion of the available research is on individual institutions or state community college systems, which limits our abiity to describe that sector of higher education as a whole. For example, Alba and Levin (1981) investigate the CUNY system in New York; Baratta and Apodaca (1984) examine the California system; both the Astin studies (Astin, 1977; Astin, et al., 1982) and Pascarella (1985) use the American Council of Education-Cooperative Institutional Research Program (ACE-CIRP) data from large but not randomly selected samples of college freshmen.

Second, much of the research is rather dated, particularly given the desire of community colleges to be quite responsive to market conditions. Many of the more sociological studies (Bowles & Gintis, 1976; Karabel, 1972, 1974; Pincus, 1974); Rosenbaum, 1976) were written over a decade ago. Athough there have been studies which have used

nationally representative samples, these have focused on the National Longitudinal Study of 1972 (Anderson, 1984; Breneman & Nelson, 1981, Meznek, 1987; Robertshaw & Wolfle, 1981; Velez, 1985). Although the samples are reasonably large and random, the the fact that the NLS students graduated from high school almost two decades ago limits generalizability to today's community colleges, especially in an educational sector which changes its focus rather frequently, in response to occupational demand.

Third, there is another set of writings on community colleges (e.g. Cohen and Brawer, 1982) which has the ring of advocacy concerning the status of community colleges, probably in reaction to the social stratification literature on this topic. These studies focus more on the economic benefits of vocational training obtained in community colleges than on their function as an alternative means to a traditional college education. These writings stress the special opportunities in higher education offered to non-traditional (i.e. minority and disadvantaged) students (Sawyer & Nickens, 1980). Even with the findings that community college attendees show lower levels of eventual educational attainment discussed above, it is difficult to completely discount a powerful argument favorable to these institutions. That is, primarily <u>because of</u> the same institutional factors which might help to explain less persistence in education for their students (e.g. the lack of academic selectivity, flexible course offerings, lower tuition levels, and proximity to students' homes), community colleges provide an opportunity to continue education for students with limited academic or economic resources.

While conceding the polarity which typifies the scholarly research on community colleges and recognizing the soundness of both sets of arguments, we are anxious to avoid placing our own research at either of the two extremes. Although most of the research focuses on the socially and academically limiting aspects of these institutions, the other strain is characterized by extolling the opportunities these schools allow to students who might otherwise be denied post-secondary education, the "second chance" for academically ill-prepared but educationally motivated high school graduates, and the market-oriented relatively high-paying vocational training typically available in community colleges.

To us, such a debate is reminiscent of the half-full half-empty metaphor. It seems clear that, by design, community colleges are not academically or socially select institutions. They do not deliver a highly demanding academic program for the majority of their students, with a considerable proportion the typical community college curriculum devoted to either remedial or vocational training. They enroll students from families of considerably lower socioeconomic status, more likely to be minority, with considerably less academic preparation and lower achievement levels. Many studies have shown that such students have lower persistence and attainment rates in higher education (Dawkins & Braddock, 1982; Donovan, 1984; Gosman, Pandridge, Nettles, & Thoeny, 1983; Hatch, 1984; Henson & Astin, 1978; Perry, 1981; Thomas, 1980). Parental influence toward students' aspirations for higher education has also been shown to be different for male and female students (Lomax & Gammill, 1984). Social integration and other non-cognitive factors have

been shown to have a strong effect on rates of persistence in higher education (Rugg, 1982; Meznek, 1987; Tinto, 1975; Tracey & Sedlacek, 1984), and community college students are less likely to have such a sense of integration because they are non-resident students. However, community colleges enroll large numbers of America's post-secondary students. Therefore, we believe that this sector of higher education must be taken seriously.

The present study attempts to improve on past research on community colleges in certain respects, without taking a stand on the socially stratifying/economically enhancing debate. First, we examine a large, current, and nationally representative sample of 1982 high school graduates to provide descriptive information on their college-going behaviors. Exactly what proportion of America's recent high school graduates enter community college, compared to those entering 4-year colleges and universities? What are the demographic and academic characteristics that differentiate these two groups, and how do the students attending these two types of colleges compare to the large group of high school graduates who do not pursue higher education? Second, the central research question of this paper focuses on the group of students who attends community college, and describes the comparative characteristics of those students do and do not transfer to 4-year college, including the proportion who actually make that transition within four years of high school graduation. More importantly, we construct a causal model to typify the background, high school experiences, and college-level experiences which appear to facilitate transfer to 4-year college for all students who attend community college

directly from high school.

METHOD

Sample and data. Data are drawn from High School and Beyond (HS&B), a multi-purpose nationally representative longitudinal study of American high school students. The sample used in this study comes from the original HS&B sample of 1980 high school seniors, which included almost 30,000 randomly selected students in over 1,000 randomly selected high schools. Information was gathered on a large subsample of these students at two additional timepoints, at two (1982) and four (1984) years after high school graduation. The total sample for these two followups (n=10,815) was used for the first part of the study. In the base year (1980), certain high schools (private schools and schools with high enrollments of minority students) were oversampled. The subsequent follow-up sample contained all the private school students and all the minority students from the original study, but reduced the remaining sample (largely white and from public high schools) to 38% of its original size. Because of this purposive oversampling at both the base year and (particularly) the followups, all analyses have employed the design weights supplied with the HS&B data. Results may thus be generalized to America's high school class of 1980. Although their proportions in the population are relatively small, parameter estimates for minority groups are stable because of the relatively larger samples for those groups resulting from the stratified sampling procedures.

The analyses which investigate the probability of transfer from

community college to 4-year college include all those students who attended community college either full-time or part-time at any semester during the first two years after high school (1980-1982), resulting in a sample of 2,500. To be included in the "transfer" group, community college students must have been enrolled in a 4-year college or university either full- or part-time, during any semester of the period between two and four years after high school graduation (1982-1984).

Analytic model. The basic approach in the causal analyses in this paper is path analysis (Pedhauser, 1982). The final dependent measure is the probability of transferring to a 4-year college, dummy coded (1=yes, 0=no). Employing a causal model which may be quantitatively evaluated with a path analytic approach allows us to examine the indirect and direct relationships between both exogenous and moderating variables and the final dependent measure, transfer probability. The structural model which guides our analyses is shown in Figure 1. This model is composed of five constructs, each of which is operationalized by a set of variables. Parameter estimates of all path coefficients are obtained using ordinary least squares regression estimation procedures (Cohen & Cohen, 1983; Pedhauser, 1982). We have employed pairwise deletion of missing data to make maximum use of the information contained in the data.

Insert Figure 1 about here

First, we evaluate the effect of the construct student background

(social class; race; and gender) on students' academically related behaviors in high school (their curricular track; whether they attended Catholic high school; how much homework they did; the number of academic math courses they took; their educational aspirations in the 10th grade; and the degree to which their parents showed interest in their academically-related acti ities). These relationships are shown as Path A on Figure 1. Second, we evaluate the combined effect of student background and high school behaviors on high school outcomes (academic achievement; grade point average; and whether the student applied to college while in high school). These relationships are shown as Paths B and C. Third, the effects of background, high school behaviors, and high school outcomes as estimated on community college behaviors (semester-hours of credit; number of semester student attended full time; grades; number of semesters of math and science courses taken; whether the student was working at the point of the first HS&B followup; whether or not the student was majoring in a science-related area; the age the student planned to enter the workforce fulltime; and a measure of job satisfaction, for those students who were working). Paths D, E, and F indicate these relationships.

Finally, we evaluate the effect of all these constructs -- background, high school behaviors, high school outcomes, and commmunity college behaviors -- on the probability of transfer from a 2-year to a 4-year college. These relationships, which represent the direct effects of all model variables on the likelihood of transfer, are shown in Paths G, H, I, and J. Results of all path analysis regressions are presented as standardized regression coefficients, in order to make

comparisons of the magnitude of effects, both direct and indirect, across the many variables in this model which are scaled in different metrics. Both direct effects of all model variables on the final dependent measures and intermediate effects that typify path coefficients for the entire analytic model, are presented.

Evaluation of direct and indirect effects; Structural equation modeling. It is theoretically possible to quantify both the direct and indirect effects of all the variables included in the model presented in Figure 1 from the path coefficients produced with OLS regression. However, such computations are tedious in practice, since the alternate "routes" for indirect effects are numerous and the computation of these indirect effects therefore complicated. Fortunately, we have available another analytic tool -- structural equation modeling using statistical estimation procedures with the LISREL program -- to compute the indirect effects rather easily (Joreskog & Sorbom, 1983). Constraining the LISREL structural model to exactly duplicate the assumptions made using OLS regression (i.e. not allowing the computation of latent constructs), we have computed both the direct and total effects of all model variables on the probability of transfer. The indirect effects of these variables on the outcome are simply the differences between the total effects and the direct effects of each variable on the dependent variable.

However, caution has been sounded about the use of structural equation modeling techniques with dichotomous outcome variables (Muthen, 1983; Muthen & Christofferson, 1981). The essential problem of using LISREL with dichotomous variables -- especially dichotomous outcome

variables -- is that the program assumes an underlying continuous and normal distribution for categorical variables. Although it is difficult to conceptualize the decision to transfer from 2-year to 4-year college as continuous, we have risked the potential (and uncorrectable) violation of this assumption to confirm and validate our structural parameters obtained under path analysis and OLS with LISREL. In this second use of LISREL, we have used the program to actually make estimations of the relationships between the latent factors of student background, high school behaviors, high school outcomes, college behaviors, and 4-year college transfer, rather than the earlier constraints to duplicate the regression model. In this analysis, we have freed or eliminated parameters according to indications from early and exploratory LISREL analyses. For all the analyses which use LISREL modeling techniques, we have employed the same correlation matrix (computed with pairwise deletion of missing data) used in the OLS analyses. We wish to emphasize that the use of LISREL in these analyses, somewhat problemmatic with a dichotomous dependent measure, is to be seen as confirmatory of our results obtained using regression methods. Maximum likelihood estimation procedures are used in these LISREL analyses, instead of the least-squares estimation methods which typify the path analysis results.

Logistic regression. In theory, statistical analyses with categorical (dichotomous) dependent measures should use logistic methods. Such analyses, designed for evaluating the effect on dichotomous outcomes variables of both categorical (dummy-coded) and continuous

predictors, estimate the effects of independent variables on the outcome variable as an odds ratio, logarithmally transformed to produce linear instead of curvilinear relationships. However, it has been found that ordinary least squares methods produce unbiased estimates of structural relationships if the distribution of the dependent measure is non-extreme (i.e. between 20% and 80%) since the middle portion of the ogive curve produced by an untransformed analysis with a dichotomous dependent measure is essentially linear (Anderson, et al., 1980; Goodman, 1978; Markus, 1979). Although the distribution of our outcome variable falls in the "safe zone" defined by Goodman and Markus (i.e. 24.3% of the community college students transferred to 4-year colleges), we have employed logistic regression methods.

However, again these methods are used to confirm the original OLS analyses, rather than as separate investigations. This caution is particularly appropriate in investigating logistic regression results, because this analytic method allows the treatment of missing data only with listwise methods, rather than the pairwise deletion which typified all earlier analyses. With a large analytic model, using survey data which contain substantial missing data, the sample size is thus considerably reduced (to less than 1,000 from the original 2,500 cases). In order to compare the results from logistic regression with those of OLS in this analysis, we have also conducted a listwise regression on the final analytic model. However, it is our opinion that substantive interpretations of results from this considerably reduced sample are problematic. Comparison of the parameter estimates, their rank orders, and statistical significance levels, are nevertheless instructive, and

give a good indication of the appropriateness of the OLS methods employed in the substantive analyses in this paper.

RESULTS

Who Goes Where?

There are only a few alternatives open to high school graduates looking to the future. In general, they must choose college or work (or both, more and more frequently). Over half (58%) of the high school class of 1980 attended college, as seen in Table 1. In order to get a clear picture of student "destination" after high school, the categories on that table are made mutually exclusive somewhat arbitrarily, using the following decision rules. If students indicated they had enrolled in a community college for even a single semester during the 1980-82 period, they were so classified. Fully 23% of high school graduates (or 40% of the college-going group) attended community college within two years of high school graduation. This large number certainly underrepresents the total numbers of students in community college, since it has been shown that only about half of the students who ultimately attend community colleges enter within two years of high school graduation (U.S. Bureau of the Census, 1985).

Insert Table 1 about here

The second data filter was for 4-year college. If students spent even one semester in such an institution (but were never in a 2-year

college), they were placed in that category. Thirty-five percent of high school graduates attended 4-year colleges right after graduation. The third data filter was employment. Those students who were not in college at all during the two years after high school graduation, but reported working 35 or more hours per week during any of four time periods queried during the two-year period after graduation, were classified as working. Of the high school class of 1980, 34% went to work full time, close to the same proportion who went to 4-year colleges. High school graduates who entered the armed forces were also included in the working category. A final group -- neither working not attending school at any time during the first two years after high school graduation -- comprised 8% of the class of 1980. It is clear that community colleges enroll large numbers of students, since almost one-fourth of all high school graduates attend such institutions within two years of graduation.

The differences in the background characteristics of these four groups are unsurprising. The social class level of the families of community college students is about midway between 4-year college attendees and those who go to work. Clearly, social class is strongly related to "who goes where" after high school, with group differences of about .3 standard deviation (s.d.) units. The college-going behaviors of the two groups of minority students -- blacks and Hispanics -- is quite different. Black students are slightly less likely to attend 2-year than 4-year college, and are about equally likely to attend college as to go to work. However, the non-working, non-student group has a higher proportion of blacks than any other group. Hispanics, on

the other hand, are almost twice as likely to attend 2-year as 4-year colleges, [2] slightly more likely to go to work or to be in the non-college non-work group. Compared to males, females are slightly more likely to be in either type of college, considerably less likely to be working, and more likely to be in the group pursuing activities other than college and work.

The academic orientation of students in these four groups is quite different. First, the differences in the achievement levels of the four groups varies considerably, with community college attendees fully one-half standard deviation below their 4-year college counterparts in high school senior-year achievement. Those who work (or do other things) are about .4 to .5 s.d. units below the community college students in average achievement. Second, community college students are as likely to come from the general as the academic curricular track (39% for each), whereas students who attend 4-year colleges are about 2.5 times as likely to be from the academic as the general track. Vocational track students are most likely to be working (understandably). General track students are very heavily represented in the working and "other" groups, where they comprise almost half of both groups. Both in terms of social background and academic orientation, these four groups vary considerably. In general, the group of students who attend community college is as different from the other group of college students as those college groups are from students not engaged in higher education.

Which Community College Students Transfer?

The remainder of the analyses in this study focus on the sample of

2,500 students who have attended community college within two years of their graduation from high school in 1980. Table 2 presents group means for the transfer and non-transfer groups on a host of variables representing the constructs of family background, high school behaviors, high school outcomes, and behaviors in community college. The differences between the means for each group on these variables have each been tested for statistical significance with t-tests (2-tailed). We realize that repeated (and thus non-independent) t-tests on the same groups create problems in interpretation, and so we make no substantive conclusions about these differences. It should be noted that, with the exception of one of the 22 variables in this list, t-test results show that all differences are significant at or below the .001 probability level. The variables described in Table 2 comprise the analytic causal model discussed below, with each set of variables comprising the constructs shown in Figure 1.

Insert Table 2 about here

A. Background characteristics. The students who transfer from community to 4-year college within two years of high school graduation are of higher social class, less likely to be minority, and more likely to be male. In fact, the SES level of the transferees closely resembles the average social class of those students who originally enrolled in 4-year colleges (see Table 1). Almost 9% more males than females transfer, and the transfer group contains almost 4 percent fewer blacks

and Hispanics than the non-transfer students. Therefore, transfer is clearly a non-random event, in terms of student background.

B. Academic behaviors and outcomes in high school. The community college students who transferred to 4-year colleges evidenced a more academic orient tion on all such measures considered in these analyses. For example, those who transferred were twice as likely to have been enrolled in the academic curricular track in high school as the non-transfer students, with the transfer group almost as likely to have come from the academic track as those who originally enrolled in 4-year college (61% vs. 65%). More than twice the proportion of the transfers as the non-transfers attended Catholic high school (11 vs. 5%). They reported having done more homework and taken a year more of academic math in high school. The transfer students were much more likely to have planned college attendance early in their high school career than the non-transfers (81% vs. 57%) and they found their parents to be much more actively involved in their academic endeavors during that period.

Although the clear majority of both groups applied to college while still in high school (88% and 75%) transferees were 13% more likely to have done so. On a composite measure of achievement taken at the senior year of high school, transfer students scored .6 s.d.'s above their non-transfer community college counterparts, but less than .2 s.d. below those who went directly to 4-year college. Thus, on many of the measures of academic orientation taken in high school, the students who attended community college and transferred to 4-year college resembled their counterparts who went directly to 4-year college more closely than

their non-transferring community college counterparts.

C. Academically related behaviors in college. Dougherty (1987) conjectured that a major factor for community college students' deficiencies in eventual attainment of the baccalaureate degree was the difficulty of transferring all the credits they had earned in community college, a phenomenon noted in less recent studies (Knoell & Medsker, 1965; Phelegar, Andrew, & McLaughlin, 1981; Van Alstyne, 1974). We have data on neither the exact number of credits which were transferable nor on whether the students who transferred had actually obtained the associate degree (although we are assuming that the majority did so). However, obtaining such a degree is strongly related to accumulating credits, and both are related to transfer. Correspondingly, those students who transferred to 4-year college had earned over 80% more credits during their first two years of college than those who didn't transfer (averages of 37 vs. 20 semester-hours).

In fact, the non-transfer group averaged fewer than one year of credit in the average college (which we assume is about 30 credits). The transferees also reported spending many more semesters in full-time status (2.9) than did the non-transfers (1.2) during the first two years after graduation. Not only did the transferees have more credits, but they did better in the courses they took. They also took more math and science courses, which are considered to be quite demanding curricular areas. More transferees indicated they planned to major in science, as well, although that difference was not statistically significant.

Half or more of both groups reported working while in college,

although the non-transfers were much more likely to so report (66% vs. 49%). However, for those students who were working, the transferees were significantly less likely to be satisfied with the work they were doing than the non-transfer students.[3] Those who transferred planned to enter the workforce full time almost 2 years later than their non-transfer counterparts, a difference of .8 s.d. units. We believe this variable acts as a proxy for educational aspirations, where later work force entry indicates more time spent in school.

It appears that there as many social and academic differences between the community college students who do and do not transfer as between the those students who attend community and 4-year colleges. Important differences related to transfer status were found in background, ability/achievement, academic orientation in high school and college, and in employment among community college attendees. However, we know that these factors are highly collinear. Therefore, we turn our investigation to a causal analysis, where these relationships may be evaluated with methods which take other variables into account. In addition, we examine both the direct and indirect effect of these variables on the probability of transfer for these students.

Causal Model of Transfer to 4-Year Colleges

A. Path analyses with OLS regression. The major analyses in this study use regression methods to investigate the structural relationships of students' background, high school behaviors, high school outcomes,

and college behaviors to the probability of transfer to a 4-year college. As such, the analyses focus exclusively on the sample of 2,500 1980 high school graduates who enrolled in community college. As stated earlier, all results reported in this (and subsequent) sections are presented in the effect size metric of standardized (beta) regression coefficients. Nominal levels of statistical significance are computed, using design weights, without making adjustment for the two-stage probability sampling design of HS&B.

1. Direct effects. Table 3 presents the direct effects of all variables in the model on the probability of transfer (paths G, H, I, and J of Figure 1). Almost a third of the variance in the dependent measure (29%) is explained by the model. It is clear that the effect of background differences, which were quite large in Table 2, are unimportant in terms of their direct effect on transfer. Likewise, only a few high-school level variables have significant direct effects on transfer. The high school-level variables defining enrollment in the academic curriculum track and the number of academic math courses in high school have significant, direct, and positive effects on eventual transfer. In the same vein, students with higher achievement levels and with better grades in high school are also significantly more likely to transfer from community to 4-year college.

Insert Table 3 about here

However, academically related college-level behaviors have even stronger and more numerous effects on the probability of transferring.

Students who have earned more credit-hours, particularly those who have been full-time students, are considerably more likely to transfer. Moreover, it is particularly courses in math and science which seem to make a difference. Although students who transferred were more likely to have indicated they were planning a major in science, once we take their coursework in science and math into account, a science major is a negative predictor of eventual transfer. Clearly, it is the behavioral measure of courses taken rather than the inclination toward science which makes a difference. The age students plan to enter the workforce is also strongly and positively related to transfer. This indicates to us that the transferees plan to be in school longer (i.e. educational aspirations) than the non-transfer students. Although having a job is not significantly related to transferring, satisfaction with that job is strongly related, with students the least satisfied with their work the most likely to transfer. We interpret this as a choice for more education over present working conditions and compensation.

2. Indirect effects on high school behaviors and outcomes. The last analysis indicated that background and high school-level variables were not strongly associated with eventual transfer for community college students -- at least not directly. However, we saw in Table 2 that there were considerable differences between the two groups of community college students on these measures. It is, therefore, likely that the relationships of these variables to transfer is indirect, rather than direct. Using the framework described in Figure 1, Table 4 investigates some of these indirect effects. Specifically, background is regressed on high school behaviors (path A), and both background and high school

behaviors are regressed on high school outcomes (paths B and C). The regressions of background on high school behaviors explain less than 10% of the variance in those variables in every case. However, it is clear that social class (SES) is strongly and positively related to all the high school behaviors we have included in this model. Once social class is adjusted for,[4] the effects of race/ethnicity are negligible on all high school behavioral outcomes except the number of academic math courses students take, with both black and Hispanic students taking fewer of these courses. Gender is related to math courses (with males taking more of such courses) and with educational aspirations in 10th grade (with females having higher aspirations). Females also do significantly more homework.

Insert Table 4 about here

Once both background and high school behaviors are included in regression models on high school outcomes, the proportion of explained variance jumps, with the model explaining between 36% (on achievement) and 9% (on applying to college while in high school). Again, SES is strongly related to these outcomes -- positively related to achievement and negatively related to both GPA and direct application to college.[5] Net of the effect of SES, there are strong effects of race/ethnicity on both achievement and GPA, with minority groups scoring significantly lower on both measures. Although female community college students got better grades in high school, they scored below their male counterparts on the composite test of achievement.

Understandably, high school behaviors strongly affect high school outcomes. Two consistent and strong effects on achievement, grades, and direct application to college are evident -- academic track membership and the number of math courses taken in high school. While it is certainly true that students in the academic track take more of such math courses, note that these effects are net of one another. That is, track placement makes an important difference even after coursetaking is taken into account (and vice versa). These are about the strongest effects seen in these models. Homework is positively related to grades and college application, but not to achievement Attendance at a Catholic high school is negatively related to br chievement and grades, once educational aspirations, track pl ent, and coursetaking are taken into account. However, it has been shown elsewhere (Lee & Bryk, 1987) that the academic behavior of students attending Catholic and public high schools is differentiated on exactly these measures. Therefore, including controls for these variables along with attendance at Catholic high school "explains away" the effect before it can be seen. We thus caution against placing a substantive interpretation on the small negative coefficient for Catholic high school attendance, despite its statistical significance. Parental influence is strongly and positively related to whether the student applied to college while in high school. This is, again, net of social class, race, and high school academic orientation.

3. Indirect effects on college behaviors. The effects of background, high school behaviors, and high school outcomes on college behaviors are shown in Table 5 (represented paths D, E, and F from

Figure 1). Except for the two variables dealing with employment (working; job satisfaction), the proportion of explained variance is adequate, ranging from 9% to 17%. The lower figures for the work-related variables is understandable, given a schooling-based explanatory model. The effect of background on these variables is small, generally. However, gender is related to several of these outcomes, with females less likely to take college math courses or to major in science. Females also plan to enter the workforce at a younger age, and more of them are working while in community college. Correspondingly, females have earned fewer credits and have attended fewer semesters as full-time students. Once SES and high school variables are adjusted for, blacks and Hispanics are likely to take more college courses in math and science, and blacks are more likely to be working. Students of relatively higher SES plan to enter the workforce later than their lower-SES community college student counterparts.

Insert Table 5 about here

High school academic behaviors are relatively strongly related to similar behaviors in college. For example, academic track membership in high school positively predicts taking more college-level science courses, entering the work force later, earning more credits, and a lower likelihood of working. Parental influence on academics in high school is positively related to several college behaviors -- science coursetaking, science major choice, semester-hours of credit, full-time status, and a later entry into the workforce. Parental influence is

negatively related to whether a student works or not, and job satisfaction if s/he works. Math coursetaking in high school is related, understandably, to math and science coursetaking in college, and to science major choice. This variable is also positively related to college GPA, and to a later workforce entry. Early educational aspirations are related to almost all college behaviors except those dealing with employment. Among the high school outcomes, achievement is negatively related to college math courses, which is possibly explained by certain students taking remedial math in community college because of low test scores. However, this variable is positively related to science coursetaking in college, where there is less likely to be remedial courses. High School grades are strongly and positively related to college GPA, coursetaking in math and science, and to credit-hours earned. Having applied to college from high school is positively related to credit-hours, science coursetaking, and (very strongly) to the number of semesters the student has attended community college as a full-time student.

Thus, we see that many of the background variables are indirectly related to whether or not a student transfers. Usually, that indirect relationship passes through high-school behaviors and outcomes, which in turn affect college behaviors. High school behaviors strongly affect high school outcomes, and also are strongly related to many academically-oriented college behaviors. This route (through college behaviors) is the major indirect path from high school behaviors to community college transfer. Many of these indirect relationships are strong, although the variety of the intermediate outcomes in this

elaborate causal model restrict the ability to make strong generalizations. We examine the relative contribution of direct and indirect effects in the LISREL analysis below.

Structural Equation Model with LISREL

In this paper, there are two purposes for which we have employed an aproach which analyzes covariance structure with maximum likelihood estimation procedures, using the LISREL program. First, LISREL was used in a path analytic framework to exactly approximate the analysis under OLS regression. In this approach, the possibility of estimating structural parameters between the latent constructs shown in Figure 1 (background, high school behaviors, etc.) is constrained. The advantage of this constraint is to use LISREL to estimate both direct effects and total effects between independent variables in the model and the dependent variable, the probability of transfer. In the second approach, we have used LISREL for true structural equation modeling, which introduces latert constructs into the model. In this second use of LISREL, we have freed parameters as indicated to estimate relationships between these constructs, rather than between model variables. All LISREL model results shown here are in the form of standardized coefficients, and all are run off the same correlation matrix from which the path coefficients discussed above were computed. The results from these two analyses are discussed separately.

A. Direct and indirect effects. The results of the LISREL analyses which have estimated direct effects and total effects are displayed in

Table 6. Even though LISREL uses maximum likelihood estimation procedures and regression uses least squares methods, the direct effects -- shown in column 1 -- are identical to the effects estimated by OLS regression shown in Table 3. However, the statistical significance levels in the LISREL analyses are somewhat higher (i.e. probabilities are lower). For example, the probability level for the effect of academic track membership on eventual transfer is below .001 in LISREL, below .05 in OLS. High school achievement and grades, semester hours in college, semesters of full-time status, and whether the student was working show lower probability levels, as well. The pattern of statistical significance is almost identical, however. The advantage of using LISREL for such an analysis is the ability also to estimate the total effect of each variable on the outcome, although significance levels for the total effects are not provided. These results are shown in column 3 of Table 6. Thus, indirect effects may be calculated, by subtracting the direct effects from the total effects. The indirect effects are shown in column 2 of Table 6. Of course, since there is no intervening step between the set of college behaviors and the outcome (see Figure 1), the direct and total effects for that set of variables are identical. There are, thus, no indirect effects of college behaviors on the probability of transfer.

Insert Table 6 about here

In general, the indirect effects of model variables on the probability of transfer to 4-year college for these community college students

are small in comparison to the direct effects. In only a few cases does the magnitude of the indirect effects equal or exceed that of the direct effects. These instances are noteworthy, however. The effect of social class on the probability of transfer is larger in its indirect than direct form (.11 vs .06). This is also the case for the effect of college aspirations in 10th grade, which is small (.03) in direct form and moderate (.07) in direct form. Whether or not the student applied to college directly from high school is also larger in indirect (.05) than in direct (-.03) effect, with sign of the effect reversed. The magnitude of the direct and indirect effects of academic track placement in high school are moderate and approximately equal (.06 and .07, respectively). Noteworthy are the magnitudes of the indirect effects of social class, track placement, math course enrollment in high school, and early college aspirations. Clearly these factors, which occur rather early in a student's academic life, are quite influential on his or her academic progress thereafter, either directly or indirectly. The indirect effect of SES is primarily through academic behaviors and outcomes in high school -- especially track placement, parental influence, math coursetaking, and educational aspirations. Track placment affects eventual transfer though its effect on high school outcomes, as well as coursetaking in college. Track is also quite influential on plans for future education, expressed here by the age the student plans to enter the workforce.

B. Latent variables in the structural model. The full structural model is shown in Figure 2, which presents gamma and beta structural

coefficients between latent factors, and factor loadings (lambda values) for the several measurement models in which individual variables are loaded onto the latent eta and ksi factors. For the sake of simplicity we have not reported the measurement error (theta) terms for the individual variables in the four measurement models. Because the original estimates of the gamma coefficients between student background and high school outcomes, college behaviors, and the probability of transfer were low, we eliminated these structural parameters from the model. Moreover, the magnitude of beta coefficients between transfer probability and both high school behaviors and outcomes were small, and therefore eliminated.

Insert Figure 2 about here

The composition of the latent factors is as follows. Student background is composed mostly of social class, with race/ethnicity and gender making minor contributions. The high school behaviors factor is strongly influenced by academic track placement, math course enrollment, and educational aspirations, with homework and Catholic high school attendance making only relatively minor contributions. The outcomes of high school are about equally made up of achievement and grades, although the act of applying to college from high school is a surprising strong contributor to this factor. The factor representing behaviors in community college is most strongly composed of coursetaking patterns, and semester-hours of credit, with the contribution of time-related plans to enter the workforce also relatively strong. Employment-related variables' contributions are much weaker.

There are strong relationships between latent factors in this model. The effect of student background on high school behaviors is strong (.477), and these behaviors in turn strongly affect both high school outcomes (.885) and similar behaviors in college (.601). The direct relationship of high school outcomes on college behaviors for these community college students is rather small, however (.047). The high school outcomes factor has been constrained to have no direct relationship to the probability of transfer, but it is behaviors in community college which strongly affects the probability of transfer (.579).

How adequate are these models in explaining this dependent measure? From Table 3 we saw that the regression model explained 29% of the variance in transfer probability. However, the proportion of explained variance may not be used as a measure of model fit in structural equation modeling. It is also the case that the usual chi-squared goodness-of-fit statistic is not particularly accurate in assessing the adequacy of fit for models which use large sample sizes, with adequacy of fit generally underestimated in such cases. Hoelter (1983) has devised another index of model fit, which he calls the "critical N" (CN). This CN statistic is not sample-size dependent. The CN statistic was computed for the LISREL model shown in Figure 2 as 215. Hoelter states that values in excess of 200 indicate that the model adequately fits the data in a covariance structure analysis. Therefore, although we have no measure of the proportion of variance explained by the model, we are reasonably assured that the model is adequately specified.

Dichotomous Outcome Variable: Logistic Regression

We have replicated our final-step regressions from the path analysis (paths G, H, I, and J) with logistic regression (logit) methods, since our final dependent variable is dichotomous (transfer/no transfer). This was not strictly necessary, since the distribution of the outcome variable was not extreme (24.3% of the sample transferred), the original analyses have falled in the "safety zone" defined by Goodman (1978) and Markus (1979). Logistic regression may be employed with the design weighting necessary for analysis with HS&B data. However, it is not possible to exactly duplicate the analyses shown in Table 3 with logistic methods. Since this logarithmic transformation method uses an iterative maximum likelihood computation procedure to place cases probablistically in one or another category, the option of pairwise deletion of missing data is not possible. As stated earlier, we chose to use pairwise deletion methods in our major analyses for good reason: in order to make maximum use of the information in the data. Therefore, we may not validate directly our analytic model from OLS regression. Instead, we have chosen to compare the logistic and OLS treatments of the same analysis by running a parallel OLS analysis, with listwise deletion. Note that these analysis are confirmatory only, and should not be interpreted substantively. The results of these parallel analyses are shown in Table 7.

Insert Table 7 about here

The disadvantage of listwise deletion is immediately obvious. That is, with a model which included 21 independent and 1 dependent variable, an original sample size of 2,500 cases has been reduced to under 800 cases. Slight variation in the sample sizes from the two methods is due to slightly different applications of the HS&B design weights by the two methods. The magnitudes of the beta coefficients estimated by the two methods are different, as well, with those estimated by the logistic method generally (but not always) larger than those estimated by least squares. An example of the reverse pattern is seen for the effect of homework, achievement, and semester-hours of credit. For the other 18 independent variables, the logit coefficients are considerably larger than the OLS coefficients. However, it is reassuring to see that the pattern of statistical significance is exactly duplicated between OLS and logit, with the same variables showing statistically significant effects on transfer probability, and to the same significance levels. Moreover, the proportion of variance explained by both methods is approximately equal in the two cases (29% and 31%, respectively). Since we make no substantive conclusions from these analyses because of the small resultant sample size, and since our range of distribution does not require the mandatory application of logistic methods, we conclude that logistic regression methods have adequately duplicated our oringinal analyses using OLS regression.

DISCUSSION

Who goes to community college? Almost a quarter of American high school graduates in the 1980's attend community college right out of high school. This fact alone shows why the study of the process of community college is important. This is particularly striking when examined in light of the fact that this represents only about half of the eventual community college enrollees (NCES, 1985). The finding that these students are considerably less advantaged -- whether considering family or academic background -- is not a new finding. However, the fact that these students fall about halfway between those students who attend 4 -year colleges and those high school graduates who do not attend college at all shows that young people are exhibiting some self-selection (or their high school performance is exerting that selection for them) in choosing to attend community college instead of (or in addition to) working.

Who transfers from community college? The fact that almost a quarter of those who attend community college have transferred to a 4-year college within four years of high school graduation, in likely pursuit of a baccalaureate degree, is an important finding of this study. That means that about 6% of America's high school graduates are using the community college "route" to college graduation. Given the large numbers that these figures represent it is clear that community college should be regarded as more than "cooling out" institutions which sap the educational motivation out of otherwise ambitious students. Conside-

rable numbers of students are using these colleges to improve their academic records and perhaps gain remediation for skills missing from their high school education. Moreover, low tuitions and the ability for students to continue living at home (and working) while taking college classes cannot be dismissed as factors which makes such institutions economically attractive to students from families with limited financial resources. Those who transfer are the less disadvantaged among community college students, however. Higher social class, lower probabilities of being minority or female, higher probability of being from the academic track, higher test scores and grades in high school, and more educational aspirations typify the background of those who transfer compared to those who don't.

What facilitates transfer from community to 4-year college? It is not surprising that a stronger emphasis on academic pursuits, perhaps at the expense of working in a satisfying job, typifies students who transfer to 4-year colleges. Accumulating more credits, being a full-time student, and working less all facilitate transferring from 2-year to 4-year colleges. However, it is also clear that there are certain academic and family situations which make this academic orientation more practical for community college students. Having been placed in the academic track in high school, and having taken more courses in academic curricular areas like mathematics, not only facilitates the academic outcomes of high school like achievement or grades (which made future transfer more likely), but these high school factors -- track and courses -- also exert direct and positive influences on eventual

transfer to a baccalaureate-granting institution. Moreover, making application to college while still in high school, a behavior which many of us take for granted as part of standard high school senior behavior, is not done by more than 20% of the students who attend community college. This behavior is strongly related to parental involvement. Moreover, social class is strongly and positively associated with almost all academic behaviors, where race is only related to a few (course-taking, achievement, grades), once we adjust for the fact that minority students are, on average, less advantaged.

We must take a slightly broader view when considering structural relationships among community college students. Our structural equation models, especially that displayed in Fugure 2, show that students' family and personal background have a strong influence on their academic behaviors in high school. In turn, these high school behaviors have pervasive effects in two directions: (1) on ultimate performance in high school; and (2) on similar behaviors in college. It is noteworthy that it is not actual peformance in high school (typified by grades and achievement) which influences college-level behaviors as much as the behavioral habit patterns formed in high schools. Included in those behaviors are, of course, the strongly influential factors of track placement and coursetaking. Only one of the five latent structural factors considered in this model has a strong and direct influence on student transfer: behaviors in college. The most important of these behaviors, as we have seen already, are selecting certain courses (especially math) and accumulating credits. Clearly, the accumulation of academic credits is strongly associated

with attending college full time. Therefore, we could conclude that more "academic press" at all stages of a student's life is facilitating to persistence. This is likely to be true for all students, but we have demonstrated here that it is certainly true for those students who attend community college, either for academic or financial reasons.

Do the best students always attend? We have shown that the institutions we call community colleges continue to offer an alternative route to a baccalaureate degree to substantial numbers of high school graduates. However, it has also been demonstrated that on average they are not capable of totally transforming an otherwise non-academic student into an academic performer. It is the relatively "better" students coming into community colleges who come out of them with academic preparation strong enough to enable them to continue their education.[7] Even for an educational sector noted for its particular advantages for disadvantaged and minority students, and one which attracts such students in large numbers, student family background and advantage are still highly related to academic success. Nevertheless, these analyses have shown that actual performance and academically-related behaviors at both the high school and college level, greatly increase the probability that a community college student will experience enough academic preparation and success to continue his or her education. What students do in school, as well as how they do, has a pervasive effect on their academic progress.

NOTES

1. We have considered this rather large group worthy of separate analysis. See Frank and Lee, 1987.

2. This is likely to be related to the fact that certain areas of the country (i.e. California and Florida) have especially well developed community college networks. These are also states which have relatively high proportions of Hispanic residents. It is difficult to identify the location of the colleges listed in the HS&B data file.

3. This interesting differences may be indicative of the general focus of these two groups. On the one hand, transferees may be using their present job only to partially support themselves, while their focus is on furthering their education. Conversely, the non-transfers would appear to see their current work less as facilitating than as a precursor to their futures. Since we are not able to investigate the occupational prestige level of actual jobs students held during this period, such a hypothesis, while logical, is untestable.

4. The effects of race or ethnicity are justifiably investigated only after adjustment for social class, in our opinion. That is because minority students have more disadvantaged family background, on average. Therefore, there are residual race effects on math

coursetaking, but not on other behaviors. However, the effects of social class (i.e. poverty) are pervasive thoughout this analysis.

5. The negative relationship of SES to these two variables is probably artifactual, since there are many other variables related to SES also in the model at this point.

6. The high school class of 1980 contained 3.04 million graduates, according to HS&B figures. Thus, over 180,000 students per year may be getting to 4-year colleges through the community college route. Such numbers are hard to ignore.

7. Of course, not all community college students want to transfer.

REFERENCES

Alba, R. and Lavin, D. (1981). Community colleges and tracking in higher education. Sociology of Education, 54, 223-247.

Anderson, K. (1981). Post-high school experiences and college attrition. Sociology of Education, 54(1), 1-15.

Anderson, S., Auguier, A., Hauck, W.W., Oakes, D., Vandaele, W., and Weisberg, H.I. (1980). Statistical Methods for Comparative Studies: Techniques for Bias Reduction. New York: Wiley.

Astin, A.W. (1977). Four Critical Years. San Francisco: Jossey-Bass.

Astin, A.W., Astin, H.S., Green, K.C., Kent, L., McNamara, P., and Williams, M.R. (1982). Minorities in Higher Education. San Francisco: Jossey-Bass.

Baratta, F. and Apodaca, E. (1984). A Profile of California Community College Transfer Students at the University of California. Berkeley: University of California. (ERIC No. ED 260 754).

Bowles, S. and Gintis, H. (1976). Schooling in Capitalist America. New York: Basic Books.

Breneman, D. and Nelson, S. (1981). Financing Community Colleges. Washington, DC: Brookings Institution.

Cohen, A.M. and Brawer, F. B. (1982). The American Community College. San Francisco: Jossey-Bass.

Cohen, J. and Cohen, P. (1983). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Second Edition. Hillsdale, NJ: Erlbaum.

Dawkins, M.P. and Braddock, J.H. (1982). Explaining outcomes for black students in higher education using national longitudinal data. Negro Educational Review, 33(3-4), 146-160.

Donovan, Rebecca (1984). Path analysis of a theoretical model of persistnece in higher education among low-income black youth. Research in Higher Education, 21, 243-259.

Dougherty, K. (1987). The effects of community colleges: Aid or hindrance to socioeconomic attainment? Sociology of Education, 60(2), 86-103.

Frank, K.A. and Lee, V.E. (1987). Who are the high school graduates who don't go to college? Paper presented at the annual meeting of the American Evaluation Association, Boston, MA.

Goodman, L.A. (1978). Analyzing Qualitative/Categorical Data. Cambridge, MA: Abt Books.

Gosman, E.J., Dandridge, B.A., Nettles, M.T., and Thoeny, A.R. (1983). Predicting student progression: The influence of race and other student and institutional characteristics on college student performance. Research in Higher Education, 18(2), 209-235.

Hatch, L.R. and Mommsen, K. (1984). The widening racial gap in American higher education. Journal of Black Studies, 14, 457-476.

Henson, J.W. and Astin, A.W. (1978). The minority pipeline: Minorities at different educational transition points. New Directions for Higher Education, 6(3), 41-46.

Hoelter, J.W. (1983). The analysis of covariance structures: Goodness-of-fit indices. Sociological Methods & Research, 11(3), 325-342.

Holmstrom, E. and Bisconti, A.S. (1974). Transfers from Junior Colleges to Senior Colleges. Washington, DC: American Counsil on Education.

Joreskog, K.G. and Sorbom, D. (1983). LISREL V and LISREL VI. 2nd Edition. Chicago: International Educational Services.

Karabel, J. (1972). Community colleges and social stratification. Harvard Educational Review. 42(4), 521-562.

Karabel, J. (1974). Protecting the portals. Class and the community colleges. Social Policy, 5(1), 12-19.

Karabel, J. (1986). Community colleges and social stratification in the 1980's. In Zwerling, L.S. (Ed.) The Community College and its Critics. New Directions in Community Colleges No. 54. San Francisco: Jossey-Bass, 13-30.

Kerckhoff, A.C. and Jackson, R.A. (1982). Types of education and the occupational attainments of young men. Social Forces, 61(1), 24-45.

Knoell, D.M. and Medsker, L.L. (1965). From Junior College to Senior College. Washington, Dc: American Council on Educaiton.

Lee, V. (1985) Access to Higher Education: The Experience of Blacks, Hispanics, and Low Socio-Economic Status Whites. Washington, DC: American Council on Education.

Lee, V.E. and Bryk, A. S. (in press). Curriculum tracking as mediating the social distribution of achievement in Catholic and public secondary schools. Sociology of Education.

Lomax, R.G. and Gammill, P.S. (1984). Sex differences and perceived parental influence on student occupational and educational aspirations. Sociological Perspectives, 27(4), 465-472.

Markus, G.B. (1979). Analyzing Panel Data. Sage University Papers Series on Quantitative Applications in the Social Sciences, No. 18. Beverly Hills, CA: Sage.

Meznek, J.M. (1987). A National Study of Student Attrition in Community Colleges: A Reevaluation of Tinto's Social Integration Model. Unpublished doctoral dissertation. Ann Arbor, MI: University of Michigan.

Muthen, B. (1983). Latent variable structural equation modeling with categorical data. Journal of Econometrics, 22, 43-65.

Muthen, B. and Christoffersson, A. (1981). Simultaneous factor analysis of dichotomous variables in several groups. Psychometrika, 46, 485-500.

National Center for Education Statistics (1977a). Transfer Students in Institutions of Higher Education. Washington, DC: U.S. Government Printing Office.

National Center for Education Statistics (1977b). Withdrawl from Institutions of Higher Education. Washington, DC: U.S. Government Printing Office.

National Center for Education Statistics (1985). Fall Enrollment in Colleges and Universities. 1983. Washington, DC: U.S. Government Printing Office.

Pascarella, E.T. (1985). Racial differences in factors associated with bachelor's degree completion: A nine-year followup. Research in Higher Education, 23(4), 351-373.

Pedhauser, E.J. (1982). Multiple Regression in Behavioral Research. Second Edition. New York: Holt.

Perry, F., Jr. (1981). Factors affecting academic performance and persistence among Mexican-American, black, and anglo students. College Student Journal, 15, 53-62.

Phlegar, A.G, Andrew,L.D, and McLaughlin, G.W. (1981). Explaining the academic performance of community college students who transfer to a senior institution. Research in Higher Education, 15(2), 99-108.

Pincus, F.L. (1974). Tracking in community colleges. Insurgent Sociologist, 4, 17-35.

Pincus, F.L. (1986). Vocational education: More false promises. In, Zwerling, L.S. (Ed.) The Community College and its Critics. New Directions for Community Colleges No. 54. San Francisco: Jossey-Bass, 41-52.

Robertshaw, D. and Wolfle, L.M. (1981). The cognitive value of two-year colleges for whites and blacks. Integrated Education, 19(3), 68-71.

Rosenbaum, J. (1976). Making Inequality. New York: Wiley.

Rugg, E.A. (1982). A longitudinal comparison of minority and non-minority college dropouts: Implications for retention improvement programs. Personnel and Guidance Journal, 61(4), 232-235.

Sawyer, J.A. and Nickens, J.M. (1980). The fulfillment of the democratization role of the community college. College and University, 55(2), 113-124.

Thomas, G.E. (1980). Race and sex differences and similarities in the process of college entry. Higher Education, 9, 179-202.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 89-125.

Tracey, T.J. and Sedlacek, W.E. (1984). Non-cognitive variables in predicting academic success by race. Measurement and Evaluation in Guidance. 16(4), 171-178.

U.S. Bureau of the Census (1985). School enrollment -- Social and economic characteristics of students: October 1980 and 1981. Current Population Reports, Series P-20, No. 400. Washington DC: U.S. Government Printing Office.

Van Alstyne, C. (1974). Higher cost of transfer: The hidden penalties. Community and Junior College Journal, 45(2), 12-14.

Vaughn, G. (Ed.) (1980). Questioning the Community College Role. New Directions in Community Colleges No. 32. San Francisco: Jossey-Bass.

Velez, W. (1985). Finishing college: The effects of college type. Sociology of Education, 58, 191-200.

Zwerling, L.S. (1976). Second Best: The Crisis of the Junior College. New York: McGraw-Hill.

Table 1: Characteristics of 1980 High School Graduates Attending 4-Year College, 2-Year College, Working Full Time, and Engaged in Other Activities (n=10,815)

	4-Year College	2-Year College	Full-Time(a) Work	Other(b) Activities
Sample Size	3778	2500	3667	870
(% in Group)	(34.9)	(23.1)	(33.9)	(8.1)
Variables:				
Social Class(c)	.267	.033	-.290	-.334
%Black	10.3	9.1	11.1	16.9
%Hispanic	5.6	10.3	11.5	14.7
%Female	53.0	52.4	45.8	61.6
Achievement(d)	55.1	50.4	46.4	44.9
Curriculum Track:				
% Academic	64.6	38.6	15.6	24.2
% General	25.4	38.5	45.1	43.8
% Vocational	10.0	23.0	39.3	32.1

[a] Members of this group were not enrolled in either 2-year or 4-year college within the first 2 years after high school. In addition, subjects were in at least one of the following three categories: (1) they reported working full-time at any of four time points after high school graduation in 1980 (2/80, 2/81, 10/81, or 2/82); (2) they were in the military during that time period; or (3) they reported working 35 or more hours per week at any job during the first 2 years after high school graduation.

[b] Members of this group were neither in college (2-year or 4-year) nor worked full time at any point in the first two years after high school graduation.

[c] SES variable is standardized (mean=0, s.d.=1) on the entire HS&B sample at the base year. Slight differences resulted from sampling down for followups.

[d] Achievement test is standardized (mean=50, s.d.=10) on the entire HS&B sample at the base year. The achievement score is an equally weighted composite of tests in reading, vocabulary, and math.

Table 2: Characteristics of Community College Students from the High School Class of 1980 Who Did and Did Not Transfer to 4-Year College by 1984

	Transferred to 4-Year College? (a)		
	Yes	No	Entire Sample
Sample Size	608	1892	2500
(%in Group)	24.3	75.7	100.0
Variables:			
Background:			
Social Class	.248*** (b)	-.051	.033
%Black	6.1	10.2***	9.1
%Hispanic	7.2	11.3***	10.3
%Female	46.1	54.8***	52.4
HS Behaviors:			
%Acad.Track	61.2***	30.8	38.6
%Catholic HS	11.3***	5.4	6.7
Hrs.Homework/Wk.	4.86***	3.54	3.90
# Math Courses,HS (d)	3.00***	2.07	2.29
%College Aspirations, Gr.10 (e)	81.2***	56.5	62.2 (48.5)
Parental Interest in S's Academics (f)	.501***	.143	.237 (.818)
HS Outcomes:			
Achievement	53.84***	49.26	50.41
GPA (1980)	3.11***	2.79	2.88
%Applied to Coll. While in HS	88.1***	75.4	78.3 (41.2)

College Behaviors:

#Semester Hrs.Credit in Comm.College	36.99***	20.24	25.05 (26.42)
#Semesters, FT in Comm.College	2.89***	1.22	2.14 (1.61)
GPA (1982)	2.87***	2.72	2.76
# Semesters,Math	0.94***	0.60	0.68
# Semesters,Science	1.03***	0.46	0.61
%Science Majors,'82 (g)	24.0	20.4	21.5
Age (in Yrs.),Planning to Start FT Work	21.49***	19.54	20.0 (2.62)
%Working, 2-82	49.1	66.3***	60.9
Job Satisfaction, (h) if Working	-0.30	0.05***	-.032 (1.03)

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[a] Students were counted as having transferred if they reported being enrolled in a 4-year college in February of 1984, 4 years after HS graduation

[b] Asteriks indicate nominal significance levels, determined by t-tests; *** $p \leq .001$.

[c] Standard deviations of means for entire community college group in parentheses.

[d] Sum of courses taken in Algebra I, Geometry, Algebra II, Trigonometry, Pre-Calculus, and Calculus while in high school. These represent <u>years</u> of math.

[e] Percent of students who said (retrospectively) that they had college expectations in the 10th grade.

[f] Factor score of variables which measure whether parents monitor school work, know what student is doing, how much parents influenced academic plans during high school and after graduation. Factor is standardized (mean=0, s.d.=1) on entire HS&B sample.

[g] Proportion of students indicating in 1982 that they had college major plans in physical or life sciences, mathematics, computer science, or engineering.

[h] Factor score of variables measuring satisfaction with aspects of most recent job (pay and benefits, challenge, working conditions, opportunities for advancement, job security, supervisor, relationship with coworkers). Factor is standardized (mean=0, s.d.=1) on entire HS&B sample.

Table 3: Effect of Background, High School Behaviors, High School Outcomes, and College Behaviors of Probability of Transfer to 4-Year College for Community College Students

Dichotomous Dependent Variable: Transfer to 4-Yr. College

Independent Variables:	
Background:	
Social Class	.06* (a,b)
Black	-.01
Hispanic	-.01
Female	-.05
High School Behaviors:	
Academic Track	.06*
Catholic High School	.04
Hours of Homework/Week	.03
# Math Courses, High School	.06*
College Aspirations, Gr.10	.03
Parental Interest in Academics	.05
High School Outcomes:	
Achievement	.07*
GPA (1980)	.07*
Applied to College While in HS	-.03

College Behaviors:

#Semester Hrs.Credit, Comm.College	.08*
#Semesters, FT in Comm.College	.06*
GPA (1982)	.02
# Semesters,Math	.12***
# Semesters,Science	.16***
%Working, 2-82	-.05
%Science Majors,1982	-.12***
Age, Planning to Start FT Work	.15***
Job Satisfaction, if Working	-.12***
% Variance Explained (R^2)	29.0

[a] Effect sizes are presented as standardized regression coefficients, in order to be able to compare the magnitude of effects across independent variables measured in different metrics. This convention applies to all regression results presented in this paper.

[b] Asteriks indicate nominal significance levels (***=p<.001; **=p<.01; *=p<.05), with no adjustment for the two-stage sampling design of HS&B. This convention applies to all results in this paper.

Table 4: Effect of Background on High School Behaviors; Effect of Background and High School Behaviors on High School Outcomes

	Dependent Variables								
	Catholic High Sch.	Academic Track	Parental Intl,Acad.	Homework, Hours/Wk.	#Academic Math Crs.	College Asp.,10th	Achievement	GPA, 1980	Applied, Coll.,HS
Independent Variables:									
Background:									
Female	.00	.01	-.03	.10***	-.05**	.09***	-.04*	.17***	-.01
Black	-.04	-.02	.03	.00	-.07***	.04	-.22***	-.12***	.02
Hispanic	.01	-.03	.04	.03	-.07***	.03	-.17***	-.08***	-.03
Social Class	.10***	.15***	.22***	.12***	.26***	.20***	.08***	-.09***	-.07***
High School Behaviors:									
Catholic High School							-.04**	-.05*	.01
Academic Track							.14***	.10***	.10***
Parental Interest in Academics							-.01	.02	.14***
Hours of Homework/Week							-.02	.08***	.06**
# Math Courses, High School							.37***	.31***	.10***
College Aspirations, Gr.10							.06**	.03	.08***
R^2 (%Variance Explained)	1.2	2.8	4.6	2.1	9.4	4.4	36.4	20.9	9.3

Table 5: Effect of Background, High School Behaviors, and High School Outcomes on College Behaviors

	Dependent Variables								
	College GPA (1982)	# College Math Crs.	#College Science Crs.	Science Major,'82	Age Plan FT Work	Satisfaction Current Job	#Semester Hrs.Credit	#Sem. FT in Comm.College	Working, 2-82
Independent Variables:									
Background:									
Fenale	-.03	-.16***	-.04	-.22***	-.16***	-.02	-.09**	-.06**	.07**
Black	-.07**	.09***	.01	.04	.02	.04	-.05	.02	.06*
Hispanic	-.01	.04*	.02.	.03	.03	.03	-.02	.01	-.01
Social Class	-.01	-.01	.05*	-.01	.08***	.03	.01	-.02	.01
High School Behaviors:									
Catholic HS	-.06	-.01	-.02	-.05	.01	-.02	-.01	.01	.05*
Acad.Trk	-.02	.04	.12***	.02	.09***	.01	.07**	.05	-.06*
Par.Int.,Acad.	-.06**	.01	.05*	.06*	.06**	-.08***	.06*	.06*	-.05*
Hrs/Wk Homework	.06**	.08***	.00	.02	.06*	-.04	.00	.01	-.07**
#Math Crs.	.09***	.15***	.07**	.19***	.08**	.05	.07*	.04	.02
Coll.Asp.,10th	-.05*	.05*	.10***	-.04	.14***	.04	.10***	.10***	-.02
HS Outcomes:									
Achievement	.01	-.11***	.07*	.06	-.04	-.10***	.03	.01	-.01
HS GPA	.36***	.10***	.13***	.03	-.04	.01	.13***	.07	.03
Applied Coll. From HS	-.02	.04	.08***	.00	.04	-.01	.11***	.23***	-.02
R^2 (%Variance Explained)	17.4	9.2	15.4	11.4	11.8	1.6	13.2	12.6	2.5

Table 6: LISREL Results for Full Model Predicting Transfer to 4-Year College for Community College Students: Direct, Indirect, and Total Effects

Dichotomous Dependent Variable: Transfer to 4-Yr. College

	Direct Effects (a)	Indirect Effects (b,c)	Total Effects (c)
Background:			
Social Class	.06*	.11	.16
Black	-.01	-.02	-.03
Hispanic	-.01	-.02	-.03
Female	-.05*	-.01	-.06
High School Behaviors:			
Academic Track	.06***	.07	.13
Catholic High School	.04*	-.01	.03
Hours of Homework/Week	.03	.03	.06
# Math Courses, High School	.06*	.08	.14
College Aspirations, Gr.10	.03	.07	.10
Parental Interest,Academics	.05**	.03	.08
High School Outcomes:			
Achievement	.07**	--	.07
GPA (1980)	.07**	.04	.11
Applied College, HS	-.03	.05	.02

College Behaviors:

#Sem.Hrs.Credit,Comm.Coll.	.08***	--	.08
#Sem. FT in Comm.Coll.	.06**	--	.06
GPA (1982)	.02	--	.02
# Semesters,Math	.12***	--	.12
# Semesters,Science	.16***	--	.16
%Science Majors,1982	-.12***	--	-.12
Age, Planning FT Work	.15***	--	.15
%Working, 2-82	-.05**	--	-.05
Job Satisfaction, if Working	-.12***	--	-.12

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[a] LISREL run was constrained to be indentical to OLS regression. As such, there were no latent factors. The direct effects are identical to those shown in Table 3, which were from OLS regression. However, significance levels are slightly higher.

[b] Indirect effects were computed as the difference between the total effects and the direct effects from LISREL.

[c] Significance tests of total and indirect effects are not conducted by LISREL.

Table 7: Comparison of Logistic and OLS Regression Results for Full Model Predicting Transfer to 4-Year College for Community College Students

Dichotomous Dependent Variable: Transfer to 4-Yr. College

	OLS Regression (a,b)	Logistic Regression (c)
Sample Size (Listwise)	726	748
Background:		
Social Class	-.018	-.072
Black	.006	.123
Hispanic	.005	,062
Female	.008	.030
High School Behaviors:		
Academic Track	.069	.335
Catholic High School	.035	.393
Hours of Homework/Week	.014	,008
# Math Courses, High School	.079*	.188*
College Aspirations, Gr.10	-.034	-.228
Parental Interest,Academics	-.018	-.117
High School Outcomes:		
Achievement	.041	.022
GPA (1980)	.026	,159
Applied College, HS	-.035	-.309

College Behaviors:

#Sem.Hrs.Credit,Comm.Coll.	.017	.001
#Sem. FT in Comm.Coll.	.125***	.246***
GPA (1982)	.062	.266
# Semesters,Math	.154***	.666***
# Semesters,Science	.177***	.630***
%Science Majors,1982	-.110**	-.855***
Age, Planning FT Work	.208***	.229***
%Working, 2-82	-.063	-.326
Job Satisfaction, if Working (d)	---	---
% Variance Explained (e)	.290	.313

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[a] Results for both OLS and logistic regressions are listwise, since pairwise deletion is not possible with logistic regression. Listwise sample sizes are from the original sample of 2500 cases. Both analyses use the HS&B design weights employed elsewhere in this paper.

[b] The effects for both regression methods are given as beta (standardized) coefficients.

[c] Logistic regression computations have used maximum likelihood methods to compute effects.

[d] The variable depicting job satisfaction has been eliminated from the model, since this variable was measured only for the students who were working at least 20 hours/week. With listwise deletion, all non-working cases would be otherwise eliminated from the analyses.

[e] Explained variance proportions are computed differently for the two methods. For OLS, this is the common R-squared figure. For logistic regression, this is the Tau-A statistic.

Figure 1: Path Model to Investigate Direct and Indirect Relationships Between Student Background, High School Behaviors, High School Outcomes, and Community College Behaviors as Predictors of Transferring to 4-Year College for Community College Students

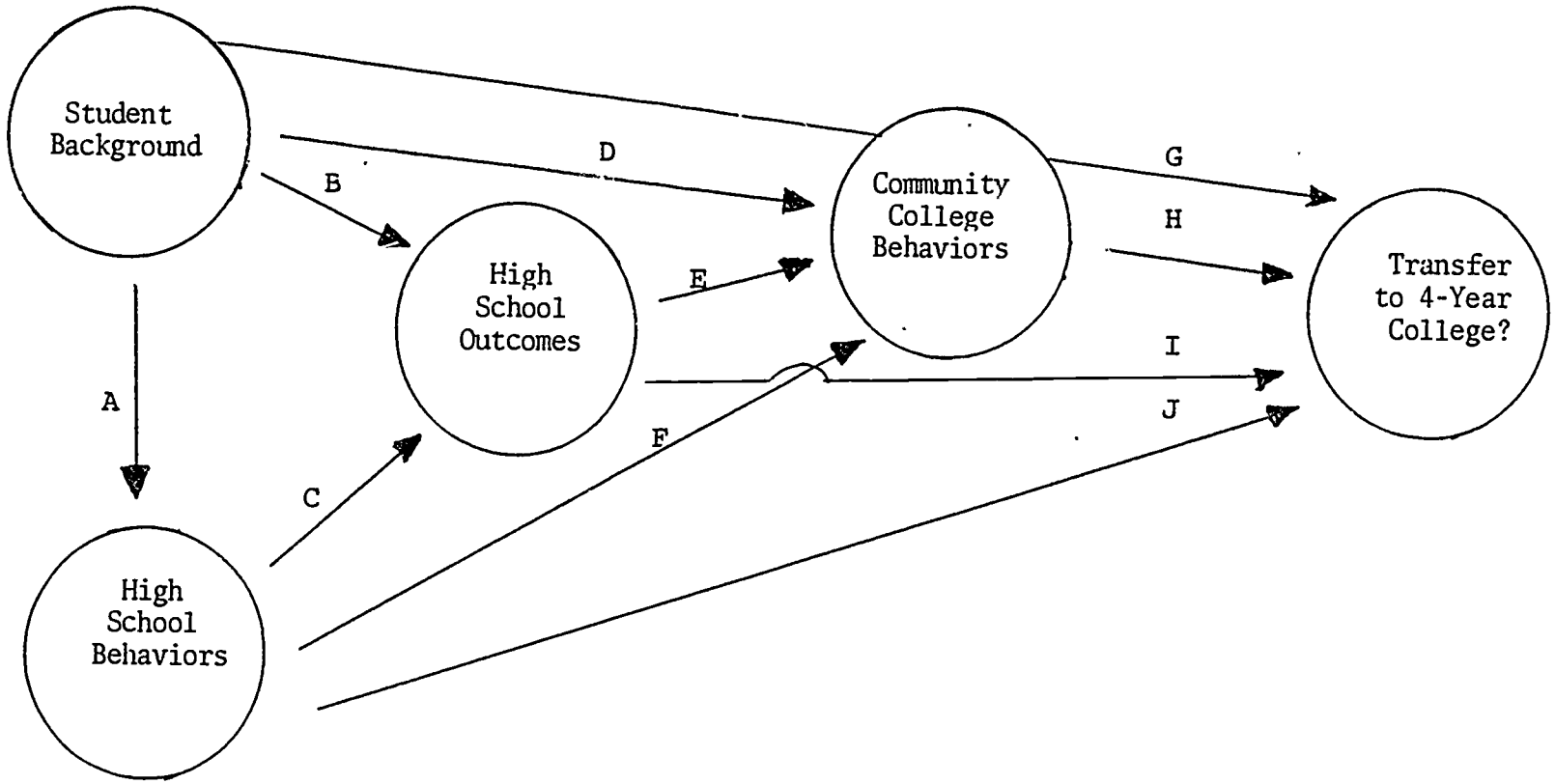

Figure 2: Full LISREL Structural Model Invertigating Community College Students' Probability of Transfer to 4-Year College